March 29, 1927.

1,622,816

F. E. SPERRY

ROTARY PUMP

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Fig. 1.

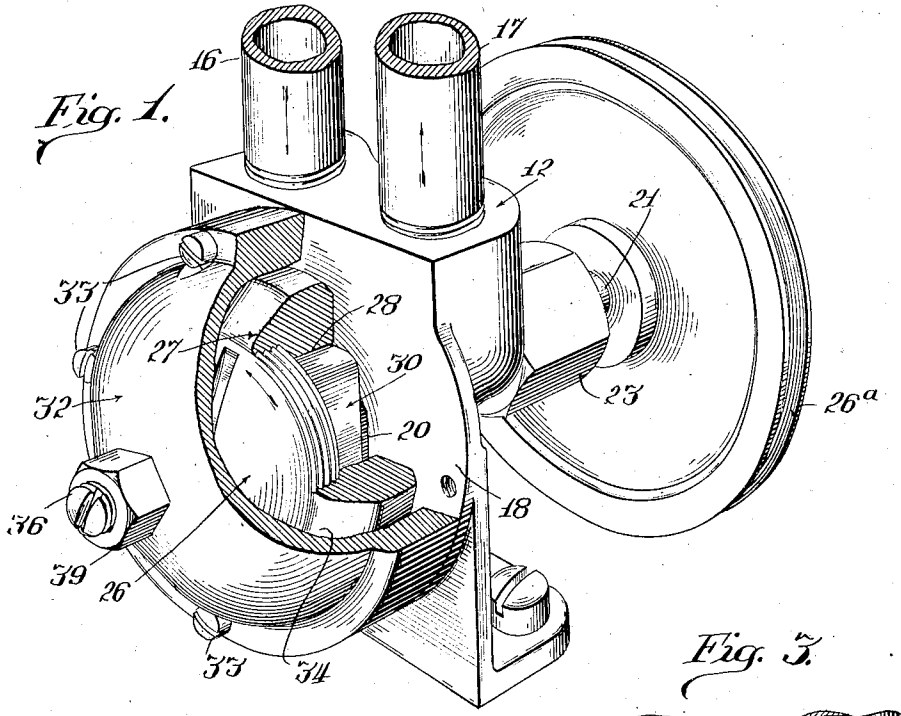
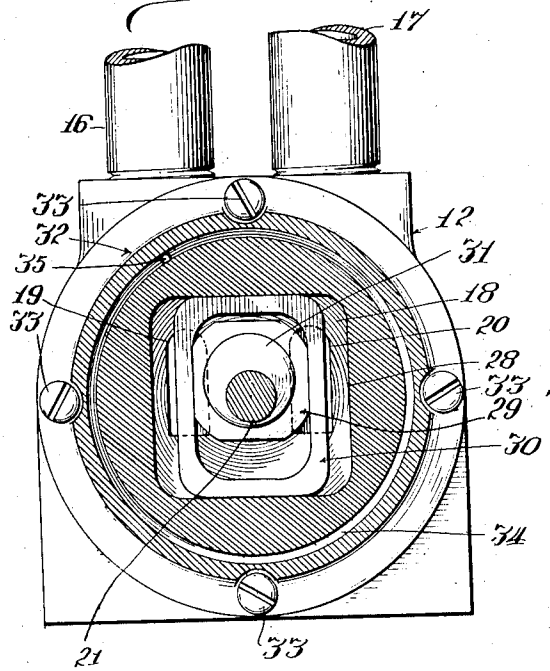
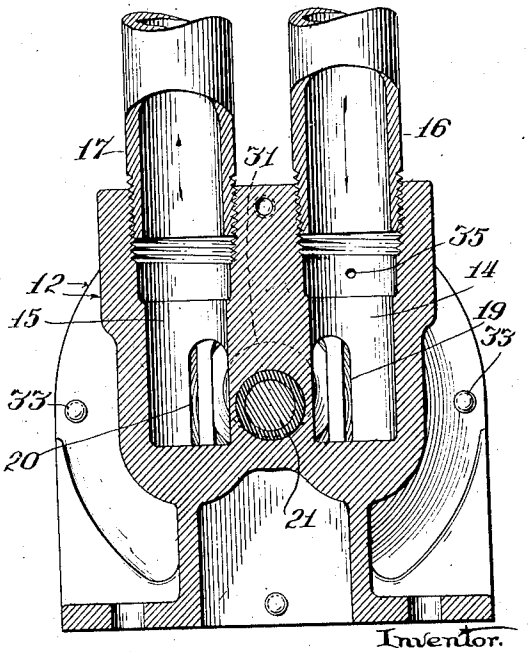


Fig. 2.



Witness
Milton Lenoir

Fig. 3.



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Fig. 4.

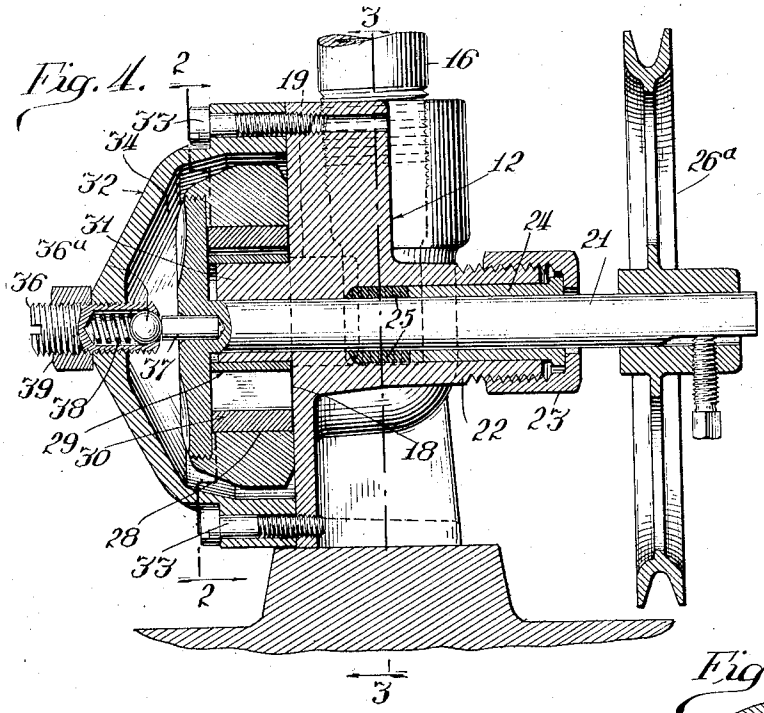


Fig. 5.

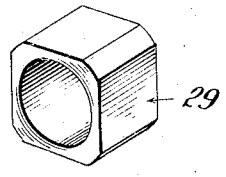


Fig. 6.

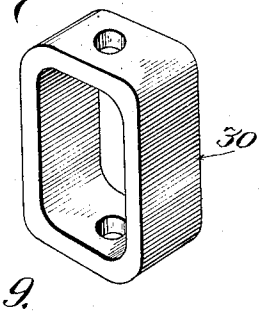


Fig. 9.

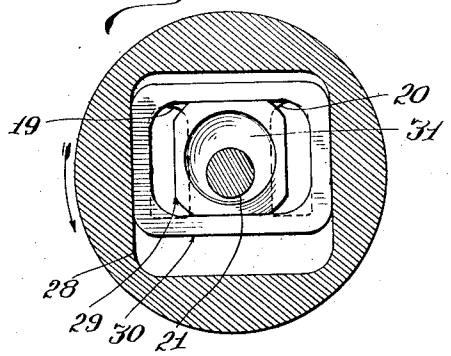


Fig. 7.

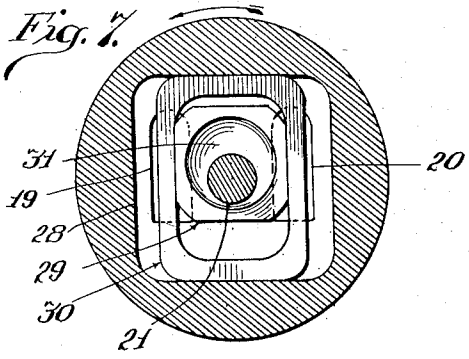


Fig. 10.

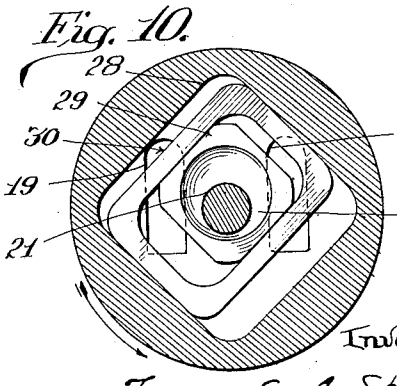
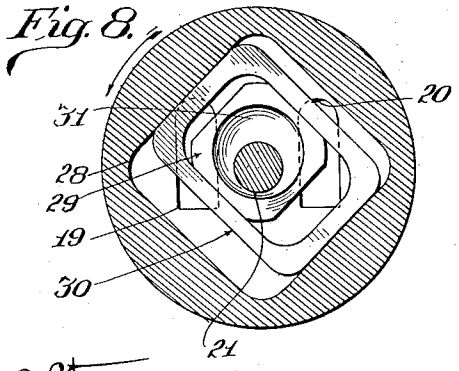


Fig. 8.



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Patented Mar. 29, 1927. 1,622,816

UNITED STATES PATENT OFFICE.

FRANK EARL SPERRY, OF BATAVIA, ILLINOIS.

ROTARY PUMP.

Application filed March 20, 1924. Serial No. 700,553.

This invention relates to rotary pumps in which the rotor comprises a plurality of pistons movable relatively to each other by the rotation of the rotor. It has for its objects to provide an improved construction by which mechanical friction will be greatly reduced without lessening the efficiency of the pump, but rather with an increase in efficiency, and by which also a hydrostatic balance will be provided, so that the pump will always operate to the best advantage. These objects I attain by the construction and arrangement of parts shown in the drawings and hereinafter particularly described. That which I believe to be new will be set forth in the claims.

In the drawings,—

Fig. 1 is a perspective view of a pump embodying my improvements, some parts being broken away;

Figs. 2 and 3 are vertical cross sections taken respectively on the lines 2—2 and 3—3 of Fig. 4;

Fig. 4 is a central vertical longitudinal section through the pump;

Fig. 5 is a perspective view of the inner piston;

Fig. 6 is a perspective view of the outer piston;

Figs. 7 to 10, inclusive, are views illustrating diagrammatically successive positions of the two pistons,—Fig. 8 indicating a movement of 45 degrees from the position of Fig. 7; Fig. 9 a further movement of 45 degrees from the position of Fig. 8, and Fig. 10 still a further movement of 45 degrees from the position of Fig. 9.

Referring to the several figures of the drawings,—12 indicates a member which with the part hereinafter referred to as a cover member constitutes a casing for the operating elements. As best shown in Fig. 3, this member 12 is provided with two cavities indicated by 14 and 15 respectively into which project and are secured the pipes which conduct the water to and from the pump,—the intake pipe being indicated by 16 and the discharge pipe by 17. The member 12 at one end is provided with a smooth flat face 18, which in the illustration is vertical, against which the pistons bear, as hereinafter described, and through which face are formed passages or ports 19 and 20 that respectively connect with the cavities 14 and 15. Extending centrally through the casing member 12 and journaled therein is a drive-shaft 21, and upon a screw-threaded extension 22 that projects from said member 12 is screwed a cap 23 that acts, as usual, to hold a gland 24 forced against a packing 25 that surrounds the shaft. To a projecting end of the shaft may be secured any usual driving means, such for example as the pulley indicated by 26ª.

Upon that portion of the shaft that projects beyond the face 18 is secured, so as to rotate therewith, a rotor which as here shown comprises a head member 26 formed integral with the shaft and a comparatively heavy body member 27 tightly screwed upon the head member. The inner face of this body member of the rotor is ground perfectly smooth so as to fit perfectly to the flat face 18 against which it bears. The rotor is provided in its inner face with a large rectangular opening or chamber 28 which overlies the passages 19, 20, and in which are located two pistons that are arranged one within the other,—the inner piston being indicated by 29 and the outer one by 30, each of these pistons being of a size to fit snugly between the head member 26 of the rotor and the face 18 against which the rotor bears. The inner piston 29 fits over and upon a stationary annular stud 31 projecting from the face 18 between the passages 19 and 20, such stud being eccentric to the shaft 21 that passes through it. The outer piston is in the form of an oblong frame and the inner piston is of a size to have a working fit between the opposite side walls of the outer piston so that such inner piston may slide back and forth longitudinally of the outer piston. The outer piston has its end walls closely but slidingly in contact with opposite walls of the chamber 28,—the result of this construction and arrangement being that the inner piston is caused to move across the face 18 by the rotation of the rotor, and at the same time the outer piston is caused to move at right angles to the movement of the inner piston across said face.

Lying over the rotor is the cover member hereinbefore referred to which in connection with the part 12 constitutes the complete pump casing. This cover member is indicated by 32, and, as shown, its edge rests against the face 18 and it is held removably

secured in place by bolts 33. It is, in the construction shown, somewhat oval in shape to conform generally to the exterior surface of the rotor, and it is spaced at a distance from the rotor, whereby is provided a chamber 34 around the rotor, which chamber I term a pressure chamber owing to the fact that pressure of the liquid therein presses the rotor and its contained pistons closely against the said face 18 of the casing. To relieve excessive pressure of these parts against such face there is provided a port 35 that connects the chamber 34 with the inlet cavity 14 with which the inlet pipe 16 communicates. This port 35, which effects the desired balancing of the rotor and its parts, will vary as to size according to the pressure desired to pump against, and thus provides a hydrostatic balance for conditions that are known to exist.

Passing centrally through the cover member 32 is a hollow plug 36 in the inner end of which is located a ball 36[a] which is in contact with a pin 37 that is located in a central opening in the rotor, a short coiled spring 38 in said plug pressing against the ball and thus tending to yieldingly hold the rotor in contact with the said face 18. The plug is held in any desired adjusted position by a lock-nut 39.

In operation and with the parts assembled as shown, the rotation of the shaft will of course rotate the rotor and with it the two pistons, and by reason of the inner piston being mounted upon the stationary eccentric bearing 31 it is evident that not only will such inner piston be caused to reciprocate in the outer piston, but the outer piston itself will be reciprocated in the chamber 28 in the rotor,—the reciprocatory movements of the two pistons being at right angles to each other as before pointed out. In Figs. 7 to 10, inclusive, are illustrated successive positions of the pistons, each of the Figures 8, 9 and 10 representing a movement of forty-five degrees from the preceding position, and from which it will be seen that upon making a further movement of forty-five degrees from the position shown in Fig. 10 the parts would be as in Fig. 7 except, of course, that what are the upper ends of the pistons in said Fig. 7 would then be the lower ends. From this it will be seen that at each rotation of the shaft there will be imparted to each piston a complete backward and forward movement. Movement of the pistons in one direction operates to draw liquid through inlet port 19 into the chamber 28, and, as is evident from the figures of the drawings, the liquid will enter the space between one of the sides of the outer piston and the adjacent wall of the chamber 28, and will also enter the space between the inner piston and the adjacent end of the outer piston. Such liquid-filled spaces will contract as the pistons slide in their reverse directions as described, thereby forcing out the liquid through the discharge passage and the pipe connected therewith.

It will be noted that the rotor is not mounted to turn in outer peripheral bearings, as has heretofore been proposed, but on the contrary, has a lateral bearing, and that at one side thereof only, the valve action being on its face instead of on its periphery. Also it is held in engagement with the face 18 by the suction of the pistons and the pressure in the chamber 28, the latter being regulated by the balancing port 35. The purpose of the spring 38 is merely to insure proper contact of the rotor with the face 18 at the time of starting the pump, by overcoming any end thrust of the motor tending to move the rotor away from said face, which would prevent the development of suction. By arranging the rotor as described, mechanical friction is greatly reduced so that the maximum degree of pumping efficiency is obtained, and by the balancing port 35 a substantially uniform pressure in the chamber 34 is maintained, thereby insuring uniform operation of the pump.

What I claim as my invention and desire to secure by Letters Patent, is—

1. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, and pistons in the latter chamber actuated by the rotation of the rotor to move transversely of the axis thereof and angularly relatively to each other.

2. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, pistons in the latter chamber actuated by the rotation of the rotor to move transversely of the axis thereof and angularly relatively to each other, and means for balancing the pressure in said pressure chamber.

3. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, pistons in the latter chamber actuated by the rotation of the rotor to move transversely of the axis thereof and angularly relatively to

each other, and a port connecting said pressure chamber with the inlet.

4. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, inner and outer pistons in the latter chamber and rotating with the rotor, a shaft extending through said bearing surface and connected with the rotor, and means operating to move said pistons transversely of the axis of the rotor and angularly relatively to each other as the rotor rotates

5. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, inner and outer pistons in the latter chamber and rotating with the rotor, a shaft extending through said bearing surface and connected with the rotor, and a stationary eccentric operating to move said pistons transversely of the axis of the rotor and angularly relatively to each other as the rotor rotates.

6. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member providing a chamber overlying said ports, inner and outer pistons in the latter chamber and rotating with the rotor, said pistons bearing on said bearing surface, and means operating to move said pistons transversely of the axis of the rotor and angularly relatively to each other as the rotor rotates.

7. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, pistons in the latter chamber actuated by the rotation of the rotor to move transversely of the axis thereof and angularly relatively to each other, and a shaft extending perpendicularly through said bearing surface and connected with said rotor member for rotating the same.

8. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member providing a chamber overlying said ports, inner and outer pistons in the latter chamber and rotating with the rotor, said pistons bearing on said bearing surface, a shaft extending through said bearing surface and connected with the rotor, and means operating to move said pistons transversely of the axis of the rotor and angularly relatively to each other as the rotor rotates.

9. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member providing a chamber overlying said ports, inner and outer pistons in the latter chamber and rotating with the rotor, said pistons bearing on said bearing surface, a shaft extending through said bearing surface and connected with the rotor, and a stationary eccentric operating to move said pistons transversely of the axis of the rotor and angularly relatively to each other as the rotor rotates.

10. In a pump, the combination with a casing having a substantially flat bearing surface provided with inlet and outlet ports, and a cover overlying said bearing surface and forming a pressure chamber thereover, of a rotor comprising a member arranged to bear laterally against said bearing surface and providing a chamber overlying said ports, pistons in the latter chamber actuated by the rotation of the rotor to move transversely of the axis thereof and angularly relatively to each other, and a spring operating to press said member against said bearing surface.

11. A rotary pump comprising in combination a casing, a rotor therein, means for driving the rotor, a piston slidably mounted in an opening in said rotor, a second piston slidably mounted in said first-named piston, and means for simultaneously reciprocating both of said pistons and independently reciprocating the inner piston longitudinally of the first-named piston, said means comprising a stationary eccentric upon which the inner one of the pistons is supported.

12. A rotary pump comprising in combination a casing having a flat bearing surface, a rotor therein bearing against said surface, means for driving the rotor, two pistons located in an opening in the inner face of the rotor and rotating therewith, one of said pistons being located within the other, and an eccentric mounting for the inner piston for causing a reciprocating movement of said pistons relatively to the rotor and to each other.

13. A rotary pump comprising in combination a rotor having in one face thereof an opening having parallel sides, a casing having a flat face in which are inlet and dis-

charge passages and against which casing face said face of the rotor bears, a hollow sliding piston in said opening in the rotor fitted between said parallel sides, a second piston fitting within said first-named piston and slidable longitudinally thereof, and an eccentric upon which said second-named piston is mounted.

14. A rotary pump comprising in combination a rotor having in one face thereof an opening having parallel sides, a casing having a flat face in which are inlet and discharge passages and against which casing face said face of the rotor bears, two reciprocating pistons, one within the other, in said opening for controlling the flow of liquid from and to said inlet and discharge passages, and means for simultaneously reciprocating said pistons and independently reciprocating the inner piston, that portion of the casing surrounding the rotor being spaced therefrom to form a pressure chamber and said chamber being connected by a port with said inlet passage.

15. A rotary pump comprising in combination a rotor, a casing enclosing the rotor and spaced therefrom to form a chamber for the reception of liquid, said casing having a face against which the rotor is pressed by the liquid in said chamber, said face having inlet and discharge passages for the liquid being pumped and also a port that communicates with said inlet passage and said chamber, a piston slidably mounted in an opening in that face of the rotor that bears against said casing face, a second piston slidably mounted in said first-named piston, and means comprising a stationary eccentric upon which the inner piston is mounted for simultaneously reciprocating both of said pistons and independently reciprocating the inner piston longitudinally of the first-named piston.

FRANK EARL SPERRY.